Cross-Connection Control vs. Fire Protection:

A WIN-WIN APPROACH FOR INSTALLING BACKFLOW PREVENTERS ON MILITARY FIRE SUPPRESSION SYSTEMS

Presentation By:

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Purpose:

Outline an approach that lets us appropriately mitigate risk posed by cross-connections between fire protection systems and distributions systems, but not jeopardize sprinkler system performance.

Introduction

- Background
  - Fire protection systems (FPS)
  - Backflow prevention devices (BPD)
- Outline Approach
  - Identify need/Establish Priority
  - Hydraulic Analyses/BPD Design
  - Implementation

Background: Fire Protection Systems

- Purpose--Control/suppress spread of fire
- Require specific flow and pressure for proper operation

Fire Protection Systems

- Water-Based Systems
  - Wet pipe
  - Standpipes
  - Dry pipe
  - Preaction
  - Deluge
- Supplied from domestic water distribution system

Fire Protection Systems

- Single [Alarm] [Detector] Check
- Static Pressure Loss as low as 1 psi
- Residual Pressure Loss as low as 3 psi
- Not a testable, approved BPD

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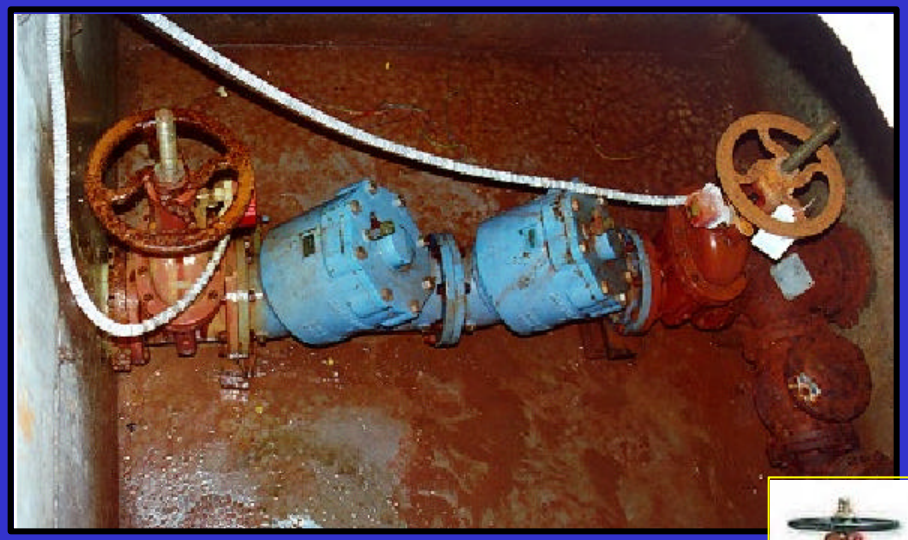
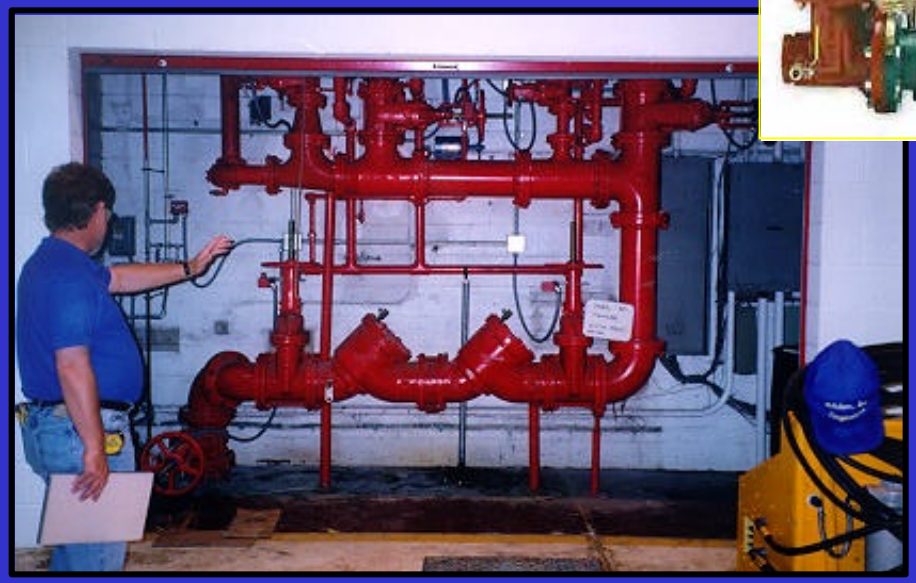
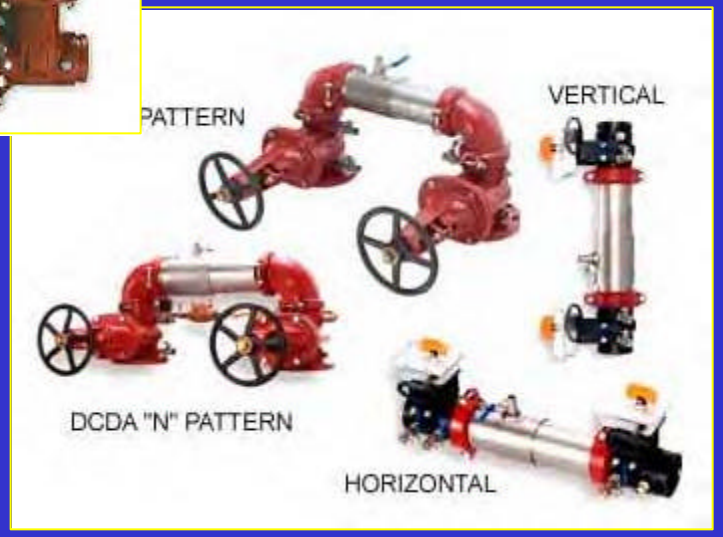
Background: Backflow Prevention Devices (BPD)

- Purpose--To prevent the backflow of contaminating or polluting substances into the drinking water system
- Degree of Hazard dictates BPD type
  - Contaminate (High)--requires reduced pressure assembly [RPZ]
  - Pollutant (Low)--requires double check valve assembly [DCV]







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Backflow Prevention Devices

- Pressure Losses

Type/Flow	DCVA (6” dia.) Pressure Loss	RPZ (6” dia.) Pressure Loss
0 gpm	4-6 psi	8-10 psi
500 gpm	2-7 psi	9-14 psi
750 gpm	3-8 psi	9-14 psi

- Periodic Maintenance
  - Annual (at minimum) testing
  - Annual flow through BPD

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Systematic Approach

- IDENTIFY NEED
- ESTABLISH PRIORITY

- HYDRAULIC ANALYSIS
- DESIGN BPD

- IMPLEMENT

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Identify Need

- 14 of 15 FPS studied (in Utah) had water that did not meet EPA Safe Drinking Water standards.
- 56 FPS studied had NTUs ranging from 1-2,000, oily residue, and bacteria “too numerous to count.”

- AWWA recent study (most comprehensive to date)
  - 84 Wet-pipe FPS in 30 water utilities nationwide.
  - Pb & Cd over primary limits in all samples.
  - Fe, Mn, TDS, sulfate, color over secondary limits.
  - Reason for backflow is failure of single check.
  - 100 gal. of FPS water backflowed in only 3 minutes.

Identify Need

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Identify Need

- Cross-connection survey
  - Familiarity with:
    - Local plumbing codes
    - Military branch/installation specific requirements
    - FPS types
  - (Example) 1996 I.P.C. all FPS; but 2000 I.P.C. specifies only wet-pipe

Establish Priority--Existing FPS

- High Degree of Hazard (HDOH)
  - AFFF
  - Corrosion control chemicals
  - Anti-freeze
  - Storage tanks
- Low Degree of Hazard (LDOH)
  - Wet-pipe, standpipes
  - Dry-pipe, preaction, deluge

PRIORITY

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Systematic Approach

- IDENTIFY NEED
- ESTABLISH PRIORITY

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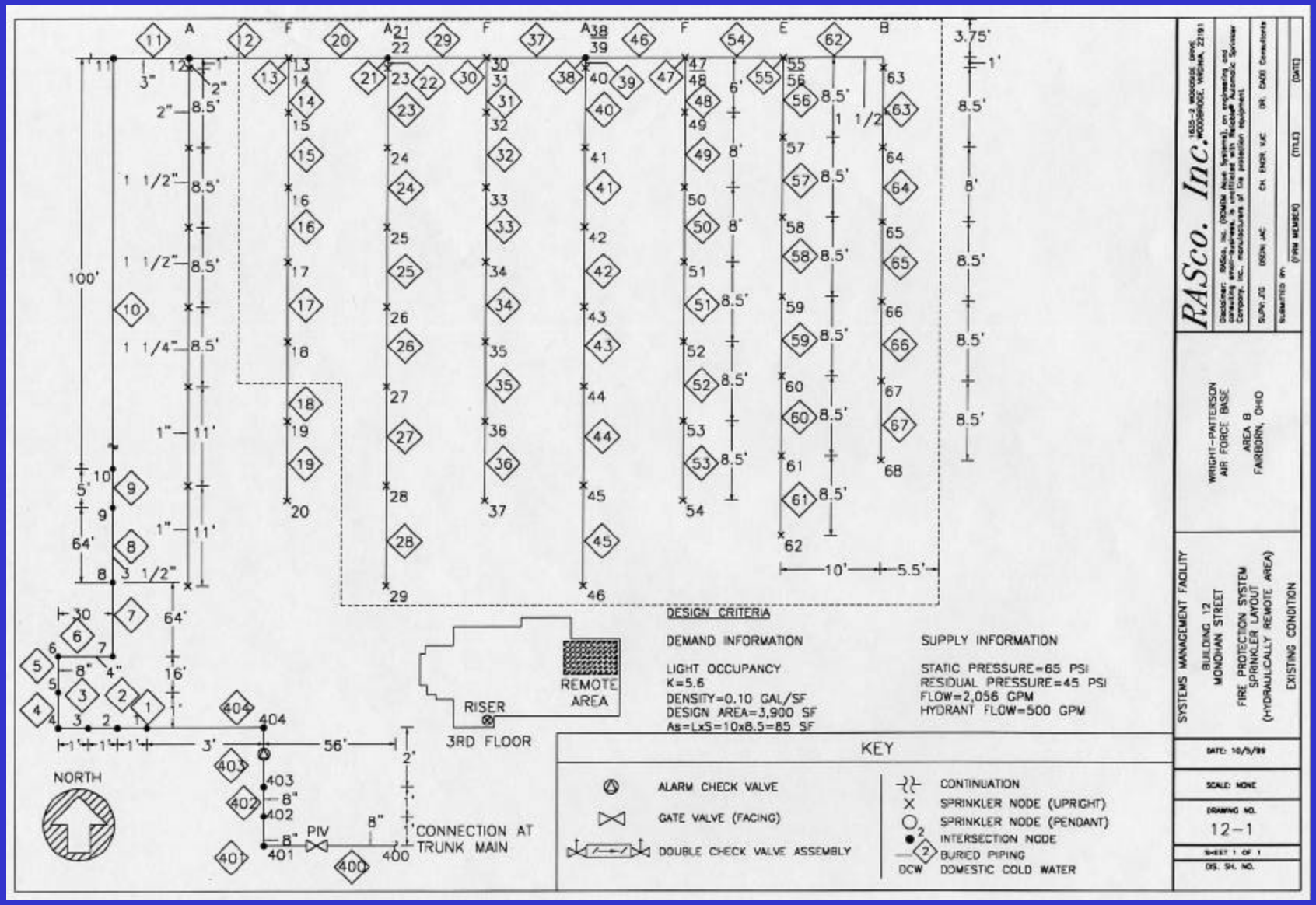
Hydraulic Analyses--Necessary to Answer:

- What is flow and pressure demand of FPS, to function properly?
- What flow and pressure is available "out in the street"?
- What is BPD impact on flow and pressure available?

FPS Demand

- Data collection
  - Survey sprinkler system
    - Type of FPS, type of sprinklers, pipe material, age of system, heights, lengths, fittings
  - Classify building activity
- Model sprinkler system to determine Hydraulically Most Remote Area using NFPA guidance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WRIGHT-PATTERSON AIR FORCE BASE
AREA B
FAIRBORN, OHIO
SYSTEMS MANAGEMENT FACILITY
BUILDING 12
MONOHAN STREET
FIRE PROTECTION SYSTEM
SPRINKLER LAYOUT
(HYDRAULICALLY REMOTE AREA)
EXISTING CONDITION
DATE: 10/3/99
SCALE: NONE
DRAWING NO.
12-1
SHEET 1 OF 1
DESIGN CRITERIA
DEMAND INFORMATION
LIGHT OCCUPANCY
K=5.6
DENSITY=0.10 GAL/SF
DESIGN AREA=3,900 SF
As=LxS=10x8.5=85 SF
SUPPLY INFORMATION
STATIC PRESSURE=65 PSI
RESIDUAL PRESSURE=45 PSI
FLOW=2,056 GPM
HYDRANT FLOW=500 GPM
KEY
ALARM CHECK VALVE
GATE VALVE (FACING)
DOUBLE CHECK VALVE ASSEMBLY
CONTINUATION
SPRINKLER NODE (UPRIGHT)
SPRINKLER NODE (PENDANT)
INTERSECTION NODE
BURIED PIPING
DCW DOMESTIC COLD WATER
NORTH
RISER
REMOTE AREA
3RD FLOOR
CONNECTION AT TRUNK MAIN
PIV
100'
64'
56'
10'
5.5'

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Supply Available

- Hydrant Flow Testing
- Water distribution system model (If current and accurate)

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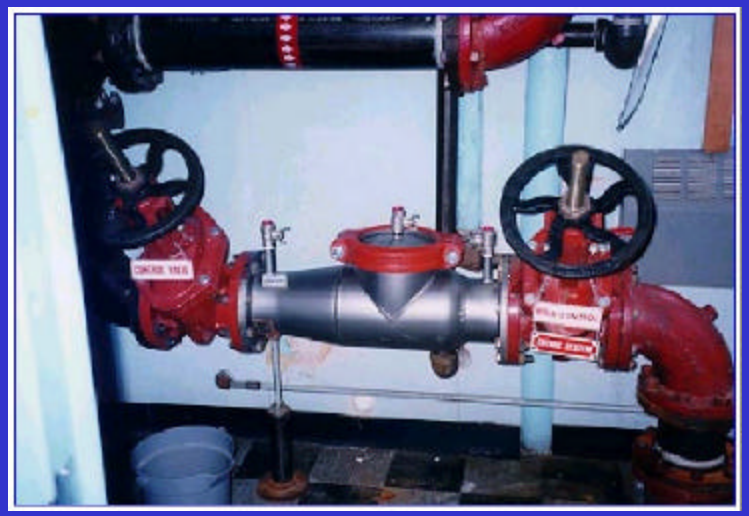
Designing BPD Installation

- Correct BPD Type
- Devices must be approved by UL and FM



- Sized for FPS flow demand
- Space constraints
- Provisions to permit routine BPD testing

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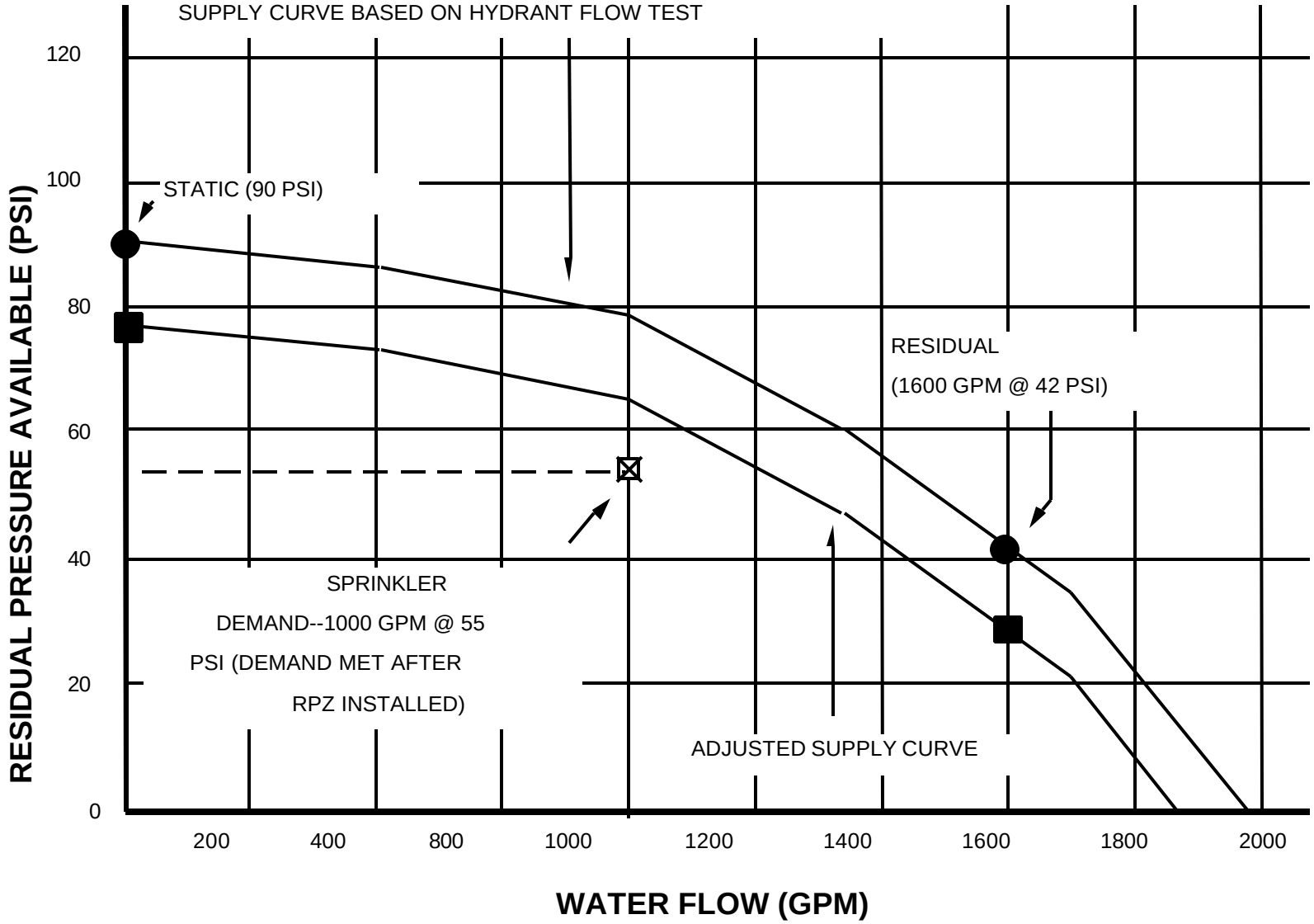

FIGURE 3: Conceptual supply versus demand curve showing adjustment for BPD

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Options for Getting a FPS to Accommodate a BPD

- Select another BPD
- Remove alarm check valve
- Change out sprinkler heads
- Change pipe material
- Create loops in FPS or distribution system
- Administrative

Systematic Approach

- IDENTIFY NEED
- ESTABLISH PRIORITY

- HYDRAULIC ANALYSIS
- DESIGN BPD

- IMPLEMENT

Implementation--Considerations

- Retrofit in priority posed by degree of hazard
  - HDOH take priority.
  - LDOH
    - When alarm checks require replacement.
    - When FPS is down for repairs.
- Ensure:
  - Proper BPD type
  - Proper installation
  - BPD tested, tagged, inventoried

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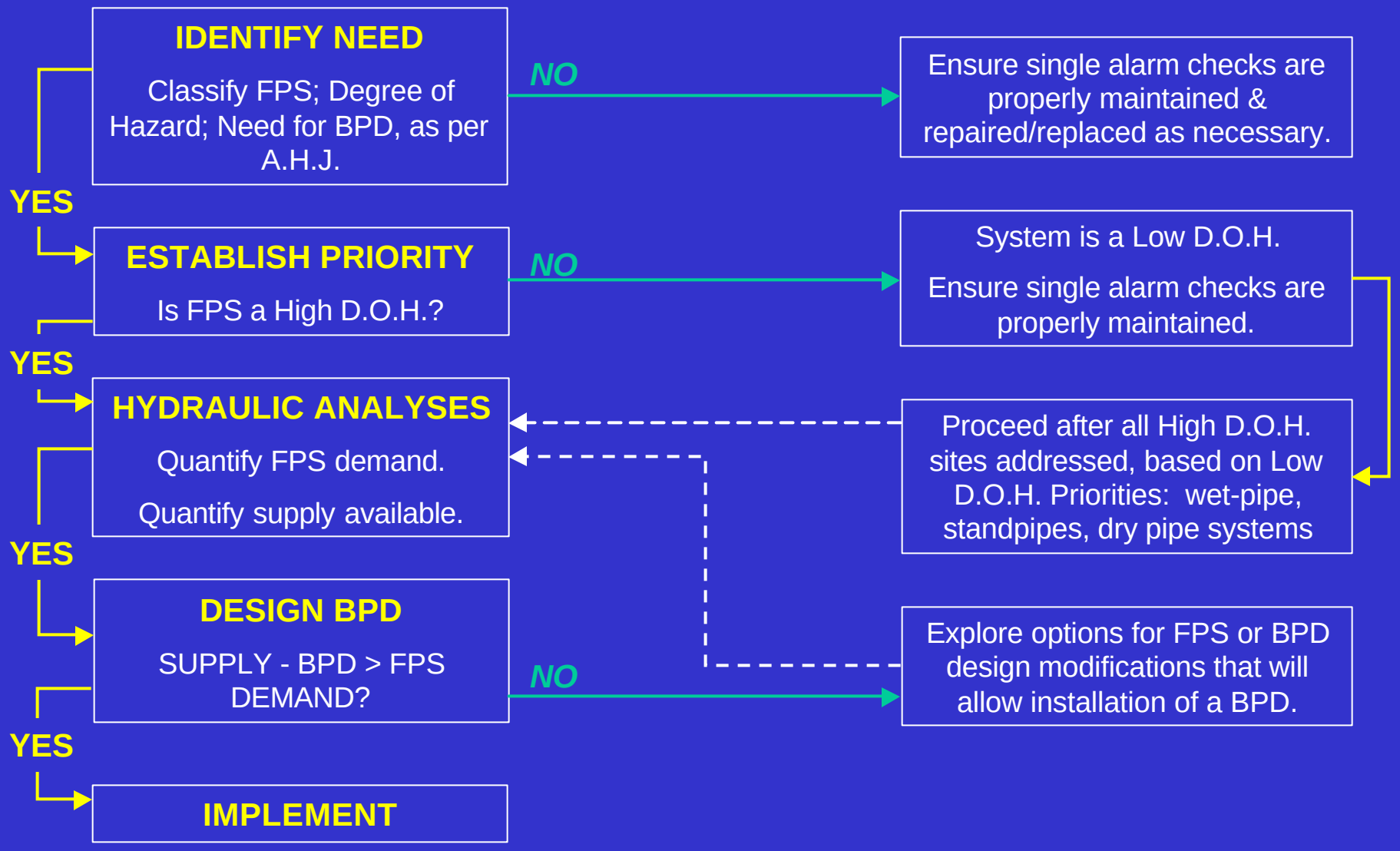
APPROACH SUMMARY
EXISTING FIRE PROTECTION SYSTEMS W/O BPDs



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Summary

Satisfying environmental regulations and your cross-connection program does not have to come at the expense of fire protection.

- Retrofit existing Fire Protection Systems:
  - Using a systematic approach;
  - Based on degree-of-hazard priority.
- For new and retrofit jobs, ensure:
  - Proper BPD type, size, and model are installed;
  - BPD is properly maintained/tested.